Of this immense volume, which will always remain a memorial of the patient research and labour of the author, just 640 pages are devoted to the bibliography. It is, perhaps, the most elaborate ever written as a preface to any form of a Report, and meeting one on the first opening of the pages, seems to challenge a few words of comment.

The importance of a bibliography to a student no one will refuse to acknowledge. A list of the works written on the subject of a Report not only shortens the references in the necessary quotations under the genera and species, but, when not required for this purpose, it helps to furnish material for further workers. Whether the list of works published should be arranged under the dates of publication or under the authors' names, alphabetically placed, has been a matter on which differences of treatment have occurred; in the present case they are arranged chronologically. The bibliography begins with the fourth century before Christ, when Aristotle wrote his "De Animalibus Historiæ," and is carried down to the present time, and is illustrated with woodcuts.

Under the date of publication, the author's name, and particulars of his birth and death, are given; these are followed by the full titles of his work, and then comes an analysis of the contents of the work, so far as these relate to Amphipod Crustacea. All of these analyses are of interest; all, or at least most, of them involved great skill and patience in their compilation; and many of them will be of service to future students. But still, it may very legitimately be doubted whether all this enormous mass of details as to the writings of the Milne Edwardses, Spence Bate, Boeck, &c., was necessary in a Report of the nature of the one before us, or whether it be in keeping with the regulations laid down for the guidance of those intrusted with the preparation of these Reports. In the printed suggestions made by the first Superintendent of these Reports, Sir Wyville Thomson, and, to the best of our belief, also approved of by Dr. Murray, was one "that no printing shall be unnecessarily repeated of matter which has already been printed elsewhere." This, it was added, does not apply to the preliminary Reports, leave to print which in various journals had been given.

If the important bibliographical list of Axel Boeck had been brought up to date, the student would have been benefited, and space would have been enormously saved; but the aim of the author seems rather to have been "to produce a record, after the annalistic method, of the progress of knowledge in this branch of natural history"—a very worthy aim, no doubt, and, as far as we can judge, well accomplished, but one outside a Report on the species taken during the *Challenger* cruise.

One hundred and eighty species are described as new, and thirty-one new genera are defined. The author feels sure that our knowledge of the group is still very imperfect, and calls attention to the fact that a few weeks' stay at Kerguelen yielded forty-eight species from this small region, previously supposed to be barren in Amphipods; and still none of the shore-frequenting species, mentioned by Dr. von Willemoes Suhm as "everywhere under stones," were apparently collected, so that still further additions to the Amphipod fauna may be expected.

As to the bathymetrical distribution of the Amphipods, there must be a good deal of uncertainty, as with other groups of animals taken in the trawls and tow-nets; some were undoubtedly taken at or near the bottom, while others were as certainly taken in the surface and subsurface waters: still, there seems some significance in the fact that, of twenty-eight species of the group of the Gammarina, said to be from depths of from 300 to 2300 fathoms, twenty-five genera are represented, of which ten are new, and twenty-six of the twenty-eight species are also new.

Many of the species described as new are as interesting as novel, but the details relating to them do not admit of being particularly referred to. In the introductory remarks, the author states that he believes the two well-known species of Gammarus, *G. pulex* and *G. locusta*, to be the representatives of an ancestral form of Amphipod.

"Far more than any other Amphipod, *Gammarus pulex* appears to have spread itself over the fresh-water streams of the world, and *Gammarus pulex* is connected by the very closest ties with *Gammarus locusta.* It is clear, from the general distribution of the Gammarina, that the chief nurseries whence they issue are the weeds of the coast. From these, the rivers are accessible, as well as the ocean; yet in the rivers the species of Amphipoda are few, while in the ocean they are multitudinous. This admits of a simple explanation, if we accept *Gammarus locusta* as representing the ancestral form which at one time occupied the world without the competition of other species of Amphipoda.

"In order to enable the family to extend its range over the fresh waters of the world, no further change was needed than such as would enable some of the progeny to pass from salt water to brackish, and from brackish to fresh. But, the section of this genus having once obtained command of the rivers, by the capacity of living vigorously in the river water, would have an immense advantage over all rivals attempting in the future to make a lodgment in the stream while their capacity for life therein was in its initial stages and only feebly developed."

There is an atlas of 212 plates, the figures on which have all been drawn by the author in a most satisfactory way. It is to be regretted that there are no detailed descriptions of these plates; perhaps with the 640 pages of bibliography, and sixty of index, this was too much to expect.

OUR BOOK SHELF.

Magnetism and Electricity. By Edward Aveling, D.Sc. (London: Chapman and Hall, 1889.)

As most intending candidates for London Matriculation will be aware, the new regulations affecting the science subjects have been in force since last June. Chemistry and natural philosophy have been replaced by mechanics, which is compulsory, and chemistry, light and heat, or magnetism and electricity, at the option of the student. To meet these new requirements Dr. Aveling has prepared a series of text-books on the specified subjects, of which the book before us is one. The book is of necessity planned on examination lines; and, although the author hopes "that the matter and method may be of service in the introduction of students generally to the subjects considered," we could hardly recommend it to those who do not require it for examination purposes. However, it completely covers the syllabus, and gives accurate, though often scanty, information. In the chapter on "Terrestrial Magnetism," for example, some very useful data are given,

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but the explanations of the methods of determining them are very meagre. Thus, on p. 22 the declination compass is described, and the explanation given for its use is simply that "the telescope is set in the plane of the geographical meridian, and, as the needle sets in the plane of the magnetic meridian, the angle between the telescope, which always lies over 0° to 180° on the circle, and the needle, is the declination." Again, referring to the determination of dip, it is simply stated "that when the instrument is arranged with the circle in the plane of the magnetic meridian, the angle of inclination can be read off on the circle" (p. 26). We fear that very few students would succeed in getting even approximate values with only these brief statements to guide them if the instruments were put into their hands.

One chapter is devoted to "Examples on Formulæ," which will, no doubt, be of great service to students, although the title is rather suggestive of cramming. The examples given are not less numerous than useful, no less than 52 out of 144 pages being devoted to them. Several of the papers set at previous Matriculation, Science and Art, and other examinations are given.

The book is well illustrated throughout, and although it is more of an epitome of the chief laws and experiments than a text-book, it will, no doubt, be of great service to those for whom it is primarily intended.

Heat and Light. By Edward Aveling, D.Sc. (London: Chapman and Hall, 1889.)

THIS is another text-book of the series referred to in the preceding notice, and follows on the same lines. It is characterized by the same bare outline, the explanations of the methods of determining the various data generally including no suggestion whatever as to difficulties and corrections. This is especially noticeable in the account of Joule's classical experiment (p. 26), in which no mention whatever is made of the corrections for loss of heat due to radiation or for the velocity of the weight on falling. The diagram, too, is seriously wrong, since it simply shows a set of vanes revolving in a vessel of water; without the pierced partitions necessary to prevent the rotation of the water, the experiment is, of course, useless.

The chapter on the composition of white light and the spectrum is perhaps the least satisfactory in the book. The merest outline of the subject is given, and there are two or three very obvious slips. On p. 165, for instance, the electric light and the lime-light are quoted as examples of monochromatic light, and again on p. 166 it is stated that "glowing gases yield spectra with *dark* lines." The idea that the actinic rays are confined to the violet part of the spectrum is rather old-fashioned, and is scarcely likely to be credited by a student who may have happened to experiment in the direction of orthochromatic photography.

Like its predecessor, the book contains numerous examples and illustrations.

The Encyclopædia Britannica. Ninth Edition. Index. (Edinburgh: Adam and Charles Black, 1889.)

THE publication of this volume (of 500 pages) marks the completion of one of the greatest literary undertakings of the present age. As to the necessity for an index there can be no doubt, since, as the editor explains, the plan of the "Encyclopædia Britannica" was that subjects rather than words should be dealt with, and that large subjects should be discussed in a connected way, under general headings, so that the book might be used not only for occasional reference, but for systematic study. This plan was adhered to, and the result is that "many things which a reader may wish to understand are explained, not under their own names, but in the course of a larger discussion." In such cases reference must be made to the index; and this is so full and so accurate that no one who may have occasion to consult it will ever have the slightest difficulty in at once finding what he wants. The index has been compiled by Mr. William Cairns, and arranged and revised by the Rev. George M'Arthur, with the assistance of Miss Emily Stevenson and Mr. J. T. Bealby. The volume contains also a complete list of contributors, with a key to the initial letters affixed to the longer articles. A glance over this list, which includes almost all the foremost writers of the day, suffices to explain the high character of the work as a whole.

Blackie's Modern Cyclopædia of Universal Information. Edited by Charles Annandale, M.A., LL.D. Vol. I. (London: Blackie and Son, 1889.)

IT is intended that the work of which this is the opening volume shall serve as "a convenient work of reference for readers of all classes—comprehensive in scope, handy in size, moderate in price, and generally adapted to the needs of the day." Of course no one who may want to obtain a thorough knowledge of any subject will think of seeking for it in such a work as this; but the editor does not place before himself too high an object of ambition when he expresses a hope that the new Cyclopædia may prove useful to persons who have little time for acquiring information from books in general, though they take an interest in many topics lying outside their own pursuits. The present volume deals with words beginning with the letter A, and with many of those beginning with B. The articles are short but clear, and, so far as they go, accurate. Especial attention has been given to matters which are of living interest in our own day, and we are glad to see that many scientific articles have been written or revised by specialists. The volume contains some good maps and many interesting pictorial illustrations.

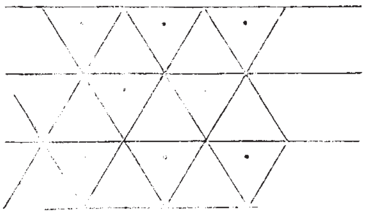
LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Spherical Eggs.

A BIOLOGICAL friend lately asked me for a solution of the problem, How many spherical eggs, 0·03 millimetre in diameter, can be contained in a cubic millimetre?, the whole space occupied by the eggs being large compared with a millimetre. Assuming the eggs as closely packed as possible in a horizontal stratum, their centres will lie at the angular points of a series of equilateral triangles whose sides are equal to a diameter. The number of spheres in this stratum corresponding to a unit of area will thus, on an average, be $\frac{2}{d^2\sqrt{3}}$, d being the diameter.

The next stratum above will have the centres of the spheres placed so that each is at the vertex of a regular tetrahedron, having alternate equilateral triangles of the lower series as base.



Evidently, in a volume of the slice between the two planes of centres, having a unit of area for its base, there will be, on an average, $\frac{2}{d^2\sqrt{3}}$ spheres. But the thickness of the slice is $d\sqrt{\frac{2}{3}}$. Hence, in a unit volume, on an average, there will be $\frac{\sqrt{2}}{d^3}$ spheres, *i.e.* $\sqrt{2}$ times, or about $\frac{7}{5}$, as many as would be contained, assuming their centres at the corners of cubes.

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